BRIEFER ARTICLES

RELATION OF FLAX TO VARYING AMOUNTS OF LIGHT

Certain features of a plant's metabolism take place in sunlight or diffuse daylight, while other changes go on during the period of darkness. In this connection the question arises, Is the amount of light (measured in duration, but not in intensity) received by a plant at any part of the earth's surface ever so prolonged as to serve as a check to the plant's growth? In other words, if the duration of the periods of darkness and light were approximately equal, would the plant make as much growth as in those cases where the light period is greatly in excess of the darkness period? In other words, does the prolonged exposure of a plant to light in a more northern latitude compensate to a considerable extent for the loss in temperature occasioned by distance from the equator? As an instance of this difference, Fort Simpson in latitude 62° N. has, between May 1 and August 31, 342 hours of daylight in excess of that received at Ottawa in latitude 45.5° N. A similar condition as regards light holds good on the higher slopes of mountains.

PFEFFER, in his *Physiology of Plants* (Engl. transl., **2**: p. 98) writes as follows:

> Plants are able to grow when continuously illuminated both in the polar regions and under artificial conditions, but the future must show whether all plants grow normally under light of constant intensity. For various reasons the same total quantity of light will not produce the same physiological effects when spread over the entire twenty-four hours, as when restricted to twelve hours of the day, or an even shorter period.

To determine the effect of shading plants during a short period each day at the time of year when the sun is longest above the horizon, certain experiments were made in 1916 at Ottawa, and repeated again during 1918. *Linum usitatissimum* was chosen, for the reason that it is shallow rooting, and has little tendency to branch when sown moderately thick, both of which are important considerations when plants have to be grown in pots.

The procedure followed in 1916 differed considerably from that of 1918, and will be described first. Four pots, each being 10 inches in diameter, were filled with the same kind of soil and were sunk in the

open ground up to the brim. A bell jar of about the same diameter as the pots was covered with brown paper and was placed over one of the pots for a certain time during the morning and over another during the afternoon, the exact duration of shading being noted in each case. The other two pots were left as checks. Care was taken to place the bell jar over the plants as far as possible during the time when no rain was falling, as the presence of additional moisture in some of the pots would have caused a disturbing factor in estimating the results. The temperature inside the bell jar was not noted, but there is no reason to believe that it was so different as to have any marked effect.

The pots were labeled *A*, *B*, *C*, and *D;* of these *A* and *C* were shaded, while *B* and *D* were the check pots. The seeds were sown in the pots on June 13, 1916. On June 26, when the first leaf in succession to the cotyledons had developed, 80 seedlings were left in each pot; the others in excess of this number were pulled up and thrown away.

Pots *A* and *C* were shaded on 11 days, beginning with June 26 and ending with July 10, the total duration of darkening being 28 hours and 23 minutes, in the case of pot *A;* and 28 hours and 28 minutes in pot *C*, *A* being shaded before midday and *C* in the afternoon.

On July 11 the number of plants in each pot was 64 in *A*, 68 in *B*, 78 in *C*, and 63 in *D*. On this date five of the tallest plants in each pot were pulled up, measured, and weighed, after shaking the earth from the roots. The average length and weight per plant in each lot were as follows:

Pot	Length	Weight
A (darkened)	109.2 mm.	122 mg.
B	112.4	125
C (darkened)	111.2	121
D	125.8	212

From July 12 to 20 inclusive, pots *A* and *C* were again shaded daily, except on the 16th, and the total period of darkening was 17 hours and 1 minute. On July 22 the 10 tallest plants were selected from each pot, measured, and weighed, with the following results per plant:

Pot	Length	Weight
A (darkened)	206.5 mm.	478 mg.
B	238.2	572
C (darkened)	183.5	430
D	256.5	936

On July 31 the first flowers were opening in pots *B* and *D*, while the first flower opened in pot *A* on August 2, and in pot *C* on August 4.

On August 10 ten of the tallest plants remaining in each pot were pulled up and weighed, with the following average results per plant:

Pot	Weight
A (darkened)	852 mg.
B	1160
C (darkened)	822
D	1712

These were the last observations made during 1916; no opportunity occurred to continue the work in 1917. In 1918 four 10-inch pots were again used, those labeled *A* and *C* being darkened, while *B* and *D* remained uncovered. As pots *A* and *B* were sown and examined on different dates from *C* and *D*, the data for each pair will be given separately. In both sets the pots were darkened during the morning only; on two out of every three days on which the plants were shaded the sun was shining at the time.

Pots *A* and *B* were sown with flax on May 7. On June 12, 29 of the tallest plants were left in each pot, the others being removed. Pot *A* was darkened altogether 34 hours and 53 minutes on 15 days, from June 12 to 29. On July 2 nine plants were in flower in each pot, and seeds were ripe in each on July 25. On July 27 all the plants were pulled up, measured, and weighed with the following results:

Pot	Average length	Average weight	Average number of capsules per plant
A (darkened)	514.6 mm.	1136 mg.	4.6
B	526.0	1236	5.5

Pots *C* and *D* were sown on June 8. On July 4, 36 plants were left in each pot. Pot *C* was darkened for 43 hours and 30 minutes on 18 days, from July 4 to 25. On July 25 two plants were in flower in *C* and six in *D*, while in both the first seeds were ripe on August 15. On this date the ten best plants in each pot were pulled up, measured, and weighed. The results are as follows:

Pot	Average length	Average weight	Average number of capsules per plant
C (darkened)	431.5 mm.	1248 mg.	5.0
D	530.5	2397	6.5

Summary and conclusions

1. Flax plants were raised in 10-inch pots placed in the open and sunk in the ground up to the brim.

2. From certain pots the light was excluded for 2–2.5 hours per day during periods of 11–19 days in all.

3. The shading of the plants took place between June 12 and July 25, and occurred at or near the time of year when the amount of daylight was greatest.

4. Tests were made on the shaded and unshaded plants as regards (1) average height, (2) average weight, and (3) average number of capsules produced. In every case the unshaded plants gave a higher figure.

5. As stems grow in length at a more rapid rate in darkness than in light, it might have been expected that the average height of the darkened plants would at least have equaled that of the unshaded ones, but the contrary was the case.—J. ADAMS, *Central Experimental Farm, Ottawa, Canada.*

PIER ANDREA SACCARDO

Dr. PIER ANDREA SACCARDO, who died February 12, 1920, was born at Treviso, Italy, in 1845. At the age of 21 he became connected with the Botanic Garden in Padua, where he remained until his death, first as Assistant Director, then as Director (1878) and Professor of Botany in the Royal University of Padua. He gave especial attention to Fungi, and contributed many papers to mycological literature. Among them were *Fungi Veneti novi vel critici*, series I–XII (1873–1882), and *Notae Mycologicae*, series I–XX (1890–1916). In the latter were included descriptions of new species from various regions of North America and from South America. He also published *Fungi Italici autographice delineati* (pls. 1–1280), and issued a set of *exsiccati* under the title *Mycothecae venetae* (cent. I–XI), and was editor and principal contributor to the mycological journal *Michelia*.

When SACCARDO began his labors in mycology, the general works of PERSOON and of FRIES had become antiquated. New systems of classification had been proposed, and descriptions of new genera and species had appeared in publications treating of limited regions and scattered in periodical literature and society transactions. The fame of SACCARDO will rest most largely on the measures he took to meet this situation. He projected and carried through the publication, in one series, of descriptions of all known species of Fungi based in the beginning on 600 separate publications. The first volume of this work (*Sylloge Fungorum omnium hucusque cognitorum*) appeared in 1882, and the task was finished when vol. VIII appeared at the end of 1889, the volumes